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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

PPS0016 – INTRODUCTION TO PROBABILITY AND STATISTICS

(All groups)

13 MARCH 2019
2:30PM – 4:30PM
(2 Hours)

INSTRUCTION TO STUDENT

1. This examination paper consists of **5 pages** (including the cover page) with **5 questions only**.
2. Each question is worth **20 marks**. Attempt **ALL** questions.
3. A normal distribution table is provided in the appendix.
4. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1

- a) The following data represents the ages of people who took part in a popular TV quiz.

27.47	27.83	22.04	27.76
20.98	19.39	22.3	x
12.17	20.06	22.38	19.36
29.05	12.04	24.2	13.51
18.31	21.69	10.97	29.06

- i) If the mean age is 21.42 years, find the value of x . [3 marks]
 ii) Hence, find the median of the data. [3 marks]

- b) The following sample data were collected from a survey:

32	38	26	29	32	41	28	31	45	36
45	35	40	30	31	40	27	33	28	30
30	41	39	38	33	35	31	36	37	32
23	45	39	37	38	36	33	35	42	38
34	22	37	43	52	32	35	30	46	36

- i) Prepare a frequency distribution table as shown below. You may expand the rows as needed. Your table must consist of 7 classes and each class must be have a width of 5. Use the smallest value in the data as the lower limit of the first class.

Class Limits	Class Boundaries	Class Midpoints, m	Tally	Frequency, f	mf	m^2f

[7 marks]

- ii) Calculate the estimated **standard deviation** of the above grouped data. [3 marks]
 iii) In one same diagram, draw a **histogram** and a **frequency polygon** based on the frequency distribution table. [4 marks]

Question 2

- a) The following table summarizes the membership for 3 student societies in a college:

Societies Joined	Number of Students
Enactus only	120
Indonesian Culture only	95
Enactus and Judo	52
Indonesian Culture and Judo only	23

The memberships for the Enactus and Indonesian Culture Societies are 205 and 167, respectively.

- i) Draw a Venn diagram representing the above information. [3 marks]
 - ii) Determine the number of students who joined **all three** societies. [2 marks]
- b) Consider the digits 0, 1, 2, 3, 4, 5. How many numbers between 300 and 500 can be formed (without repetition) if
- i) there are no other restrictions? [3 marks]
 - ii) they must be multiples of 5? [4 marks]
- c) From a recent study, it is known that the probability of bankers choosing one risky investment from options A, B and C are 0.2, 0.5, and 0.3, respectively. It is also known that the chances of making a **loss** in those investments are 35%, 25% and 40%, respectively. Assume that each banker either lost or profited.
- i) Draw the probability tree representing this information. [3 marks]
 - ii) A random banker is selected and is found to have made a **profit**. What is the probability that it resulted from investment B? [5 marks]

Question 3

- a) An electronics lab has in its storage 20 multimeters available for students to use, of which 3 are defective. A lab instructor randomly selects 4 multimeters to be distributed to students for them to use in the class. Let X be the number of defective multimeters selected by the instructor.
- i) Prepare a probability distribution for X . Show all the steps. [8 marks]
 - ii) Find the probability that at most two multimeters selected were not defective. [3 marks]
- b) A random variable X has the probability density function defined as follows:

$$f(x) = \begin{cases} k(x + 2x^2) & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

- i) Find the value of the constant k . [3 marks]
- ii) Hence, find the variance of the random variable X . [6 marks]

Question 4

- a) A magic coin lands heads up 40% of the time. If the coin is tossed 5 times,
- i) find the probability that **at most** 3 tails will occur. [4 marks]
 - ii) determine the mean and standard deviation of the number of tails. [4 marks]
- b) Shuri is gathering data on the distribution of metal defects along a vibranium beam. On average, the number of defects per meter is 2. Using the appropriate probability formula, find the probability that, on a randomly selected vibranium beam length of 2 meters, there will be 4 or 5 defects. [6 marks]
- c) Wall-E compresses collected trash into cubes. The mass, X kg, of each compressed trash cubes can be modeled by a normal distribution with mean 5.2 and standard deviation of 0.1. Find the mass that is **not exceeded** by 80% of the cubes. [6 marks]

Question 5

- a) The distribution of star ratings given by critics for the movie Venom has a mean of 5.2 and a standard deviation of 1.9. A sample of 50 reviews is selected.
- i) What is the probability that the average star rating of the sample is **below** 5? [6 marks]
 - ii) What theorem was used to solve part (i), and what condition allows its application? [2 marks]
- b) The true proportion of smokers with lung problems among all smokers in Malaysia is 65%. A random sample of 25 smokers is taken.
- i) Find the type of sampling distribution of the sample proportion $\hat{p}$ and its parameters. [3 marks]
 - ii) What is the probability that less than 50% are smokers with lung problems? [6 marks]
 - iii) What condition(s) had to be fulfilled in order to assume the normal distribution in this situation? [3 marks]

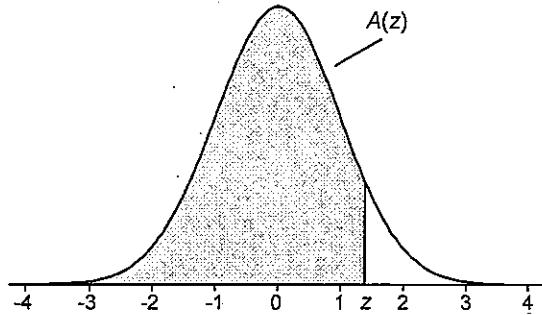
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Appendix

TABLE A.1

Cumulative Standardized Normal Distribution

$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:



z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							